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EXAMINER

STONE, ROBERT M

ART UNIT	PAPER NUMBER
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2629

NOTIFICATION DATE	DELIVERY MODE
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ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	Application No. 10/578,786	Applicant(s) SMITH ET AL.	
	Examiner Robert M. Stone	Art Unit 2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 April 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7, 15-18, 22-24, 26, 27, 30, 31 and 33-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 15, 22-24, 26, 27 and 30-31 and 33-36 is/are rejected.
- 7) ☒ Claim(s) 16-18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. The amendment filed on 13 April 2009 has been entered and considered by the examiner.

Priority

2. Acknowledgment is made of applicant's claim for foreign priority based on an application filed on 04/20/2006. It is noted, however, that the "Petition to Add Unintentionally Delayed Claim of Priority Under 35 USC 120 and 37 C.F. R. 1.78(a)(3)" filed 23 March 2007 has been reviewed by the Office of Petitions and has been "Dismissed as moot" in the response mailed on 11/16/2007.

Specification

3. The amended disclosure is objected to because it contains an embedded hyperlink and/or other form of browser-executable code on page 5 of the Amendments to the Specification. Applicant is required to delete the embedded hyperlink and/or other form of browser-executable code. See MPEP § 608.01.

Claim Objections

4. Claim 7 is objected to because of the following informalities: Minor grammatical error in that the sentence ends with a comma. It should end with a period. Appropriate correction is required.

5. Claim 33 is objected to because of the following informalities: Minor grammatical inconsistency in that factorization is spelled both "factorisation" and "factorization" in the claim language. Appropriate correction is required.

Claim Rejections - 35 USC § 101

6. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 22 & 33 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The preamble recites "A carrier carrying processor control code". As describe in the amended specification the carrier can be a "data carrier such as an optical medium". Therefore, the claimed "carrier" is clearly not a "process" under 35 U.S.C. 101 because it is not a series of steps. Further, the claimed "carrier" as per the cited portion of the specification is not limiting in that an "optical medium" could be a fiber optic cable or even air providing a path for optical/light waves to travel. Therefore, this claimed "carrier" does not itself perform any useful, concrete and tangible result but just provides a transmission means of a signal, thus, does not fit within the definition of a machine. Therefore, a claimed signal does not constitute patentable subject matter as set forth in 35 U.S.C. 101. As such, the claim is not limited to statutory subject matter and is therefore non-statutory.

In view of the below cited MPEP section the claims are non-statutory because they are functional descriptive material per se.

MPEP 2106.01 [R-5]

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) Both types of "descriptive material" are nonstatutory when claimed as descriptive material per se, 33 F.3d at 1360, 31 USPQ2d at 1759.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1-6, 15, 23-24, 26-27, 30-31, 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Yamano* (US 2004/0066363) in view of *Smaragdis* (US 2005/0021333).

As to **claim 1**, *Yamano* discloses a method of driving an organic light emitting diode display (method applied to numerous types of displays including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the method comprising:

receiving image data for display (receives input image data for driving the display [0012,0204,0628,0633,0638]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15);

factorising said image matrix into a product of at least a first factor matrix and a second factor matrix (image data factored into scan matrix (row) and column matrix (signal) with ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix defining column drive signals for said display (second matrix of scan line X signal line is a matrix of signal line values for one signal line); and

driving said display row and column electrodes using said row and column drive signals respectively defined by said first and second factor matrices (display shown in Figs. 16, 26, 27, 31, 35, and 39-43 are being driven according to display matrices of Figs. 8-15).

Yamano does not expressly disclose wherein said factorising comprises non-negative matrix factorisation (NMF).

Smaragdis discloses factorizing image data using non-negative matrix factorization (2D image/video information is constructed using non-negative matrix for analysis [0041-0046]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 2**, *Yamano* discloses wherein said driving comprises driving a plurality of said row electrodes in combination with a plurality of said column electrodes (the plurality of scan lines are each driven in combination with the driving of the signal lines in order to display the data signal in the pixel; Figs. 27,31,35,39-43. Further, multiple scan lines can be driven simultaneously using the multi-line selection MLS driving [0014,0202,0298,0313,0522]).

As to **claim 3**, *Yamano* (Figs. 26, 27, 31, 35, 39-43) discloses wherein said driving comprises driving said display with successive sets of said row and column signals to build up a display image, each said set of signals defining a subframe of said display image, said subframes combining to define said display image (drives sets of rows and columns within each subframe in order to build up a display image by the end of the full frame since a frame is a sum of the subframes [0343,0536,0559]).

As to **claim 4**, *Yamano* discloses wherein a number of said subframes is no greater than the smaller of a number of said row electrodes and a number of said column electrodes (The number of subframes is 4 (Figs. 39-43) and according to Figs. 50-53, the number of display scan lines is greater than 18 and the number of signal lines is 8 however, this is an exemplary schematic and is in no way meant to be limiting).

As to **claim 5**, *Yamano* discloses wherein said number of subframes is less than the smaller of a number of said row electrodes and a number of said column electrodes (The number of subframes is 4 (Figs. 39-43) and according to Figs. 50-53, the number of display scan lines is greater than 18 and the number of signal lines is 8 however, this is an exemplary schematic and is in no way meant to be limiting).

As to **claim 6**, *Yamano* (Fig. 26) discloses wherein said first factor matrix has dimensions determined by a number of said row electrodes and a number of said subframes (a driving matrix will vary depending on the number of scan lines and subframes to be driven since the rows of a driving matrix correspond to each subframe of a frame and the columns correspond to each scanning line therefore depending on the number of subframes and scanning lines the display to be driven has, the size of the matrix will vary. This is further reflected in Figs. 8-15 where the scan matrix of 8 column values is for driving 8 scan lines [0299]), and wherein said second factor matrix has dimensions determined by a number of said column electrodes and said number of subframes (although shown in an

Art Unit: 2629

exemplary case of a driving matrix for 1 signal line (Figs. 9-15) where it is driven as shown Fig. 16 this is not meant to be limiting as the matrix will change as the number of lines change).

As to **claim 15**, *Yamano* (Figs. 8-15) discloses wherein said image matrix comprises an $m \times n$ (row x column) matrix I (resultant matrix of time X signal line is an 8×1 driving matrix but is exemplary and as shown in Figs. 50-53 more signal lines than 1 would exist in an actual display) and said first and second factor matrices respectively comprise an $m \times p$ (row x column) matrix W (first factor matrix of time X scan line is an 8×8 matrix for 8 scanning lines) and a $p \times n$ (row x column) matrix H (second factor matrix of signal line X scan line is an 8×1 matrix for 8 scanning lines by 1 signal line) and where $I \approx W.H$ (final image matrix I is approximately equal to first factor scanning matrix and second factor signal matrix).

Yamano does not explicitly disclose where p is less than or equal to the smallest of n and m in Figs. 8-15. However, this is because *Yamano* is only illustrating an example using one signal line for illustrative purposes. As indicated in Figs. 50-53, the intended display to be driven does in fact contain 8 or more signal lines which is greater than or equal to the time dimension of the above driving matrix.

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have provided a larger matrix to account for more signal lines in the display as taught by *Yamano* Figs. 50-53 in the matrix of *Yamano*

Art Unit: 2629

Figs. 9-15. The suggestion/motivation would have been to account for more than one column line of data driving signals there by increasing the native resolution of the display.

As to **claim 23**, *Yamano* discloses a driver (segment line and scanning ICs [0014,0265,0288]) for an emissive display (displays include numerous types including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the driver comprising;

an input for receiving image data for display (image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0502,0503]);

a system for factorising said image matrix into a product of at least a first factor matrix and a second factor matrix (image data factored into scan matrix (row) and column matrix (signal) with ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix defining column drive signals for said display (second matrix of scan line X signal line is a matrix of signal line values for one signal line); and

Art Unit: 2629

output means to output said row and column drive signals respectively defined by said first and second factor matrices (scanning and segment line driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]), wherein all elements of said second factor matrix are equal to or greater than zero (second factor matrix corresponding to signal column driving values are equal to 1 in Fig. 15).

Yamano does not expressly disclose wherein all the elements of said first factor matrix are equal to or greater than zero.

Smaragdis discloses wherein all the elements of a first and second factor matrices are equal to or greater than zero (when using the factoring method of non-negative matrix factorization 2D image/video information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 24**, *Yamano* discloses method of driving an organic light emitting diode display (method applied to numerous types of displays including OLED [0201,0202]), the display having a plurality of pixels each addressable by

Art Unit: 2629

a row electrode and a column electrode (in the matrix type display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the method comprising:

receiving image data for display (receives input image data for driving the display [0012,0204,0628,0633,0638]; Further image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]);

formatting said image data into a plurality of subframes (image data matrix is formatted to account for the number of subframes within one frame [0343,0536,0559] and the way it is applied is illustrated in Fig. 26), each said subframe comprising data for driving a plurality of said row electrodes simultaneously with a plurality of said column electrodes (the plurality of scan lines are each driven in combination with the driving of the signal lines in order to display the data signal in the pixel during 4 subframes of one frame [0343]; Figs. 27,31,35,39-43. Further, multiple scan lines can be driven simultaneously using the multi-line selection MLS driving [0014,0202,0298,0313,0522]); and

driving said row and column electrodes with said subframe data (scanning and segment line drivers drive the lines of the display according to the subframe data in order to build up a display image by the end of the full frame since a frame is a sum of the subframes [0343,0536,0559]),

wherein said formatting comprises compressing said image data into said plurality of subframes (input image data is compressed into matrix form wherein each piece of subframe data is part of the desired image so that when the

Art Unit: 2629

subframes are driven sequentially, their combination are seen as a compressed image [0343,0536,0559]; Figs. 8-15, 16, 26, 27, 31, 35, and 39-43).

Yamano does not expressly disclose wherein all driving data are only positive or zero data or wherein said compressing comprises non-negative matrix factorisation.

Smaragdis discloses wherein all data are only positive or zero data and wherein compressing to get the data involves non-negative matrix factorisation (when using the factoring method of non-negative matrix factorization 2D image/video information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 26**, *Yamano* discloses wherein said display comprises a multicolour display, wherein said image data comprises colour image data (red, green, and blue image data for driving a color display [0389,0420,0581,0585, 0778,0946]), and wherein said compressing comprises compressing data for a green colour channel of said display less than data for at least one of a red and a blue colour channel of said display (more bits are used for image data of green and red while blue is compressed to fewer bits [0585,0778]).

As to **claim 27**, *Yamano* discloses wherein said formatting is configured to generate subframe data (image data matrix is formatted comprising driving data for multiple subframes in one image frame [0343,0536,0559; Fig. 26] and the way it is applied is illustrated in Fig. 26 stored in display memory along with ROM for storing the processing matrices [0501,0802,0803]) such that data from more than one said subframe enables driving a pixel of said display (pixel image data of each frame is split into 4 subframes for driving [0343]; Figs. 27,31,35,39-43), whereby more than one said subframe contributes to an apparent brightness of pixels of the display (when driving displays using subframes, the sum of the subframe gradation values over one frame period drives the pixel for that frame and the amount of gradation/image data driven to the pixel directly contributes to the resulting brightness of the displayed pixel since gradation data includes brightness information [0523, 0828]).

As to **claim 30**, *Yamano* discloses wherein said image matrix comprises an $m \times n$ (row x column) matrix I (resultant matrix of time X signal line is an 8×1 driving matrix but is exemplary and as shown in Figs. 50-53 more signal lines than 1 would exist in an actual display) and said first and second factor matrices respectively comprise an $m \times p$ (row x column) matrix W (first factor matrix of time X scan line is an 8×8 matrix for 8 scanning lines) and a $p \times n$ (row x column) matrix H (second factor matrix of signal line X scan line is an 8×1 matrix for 8 scanning lines by 1 signal line) and where $I \approx W.H$ (final image matrix I

Art Unit: 2629

is approximately equal to first factor scanning matrix and second factor signal matrix).

Yamano does not explicitly disclose where p is less than or equal to the smallest of n and m in Figs. 8-15. However, this is because *Yamano* is only illustrating an example using one signal line for illustrative purposes. As indicated in Figs. 50-53, the intended display to be driven does in fact contain 8 or more signal lines which is greater than or equal to the time dimension of the above driving matrix.

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have provided a larger matrix to account for more signal lines in the display as taught by *Yamano* Figs. 50-53 in the matrix of *Yamano* Figs. 9-15. The suggestion/motivation would have been to account for more than one column line of data driving signals there by increasing the native resolution of the display.

As to **claim 31**, *Yamano* discloses wherein said display comprises a passive matrix and organic light emitting diode display (applied to a simple matrix display [0013,0202,02640288,0289] of numerous types of displays including OLED [0201,0202]).

As to **claim 34**, *Yamano* discloses a driver (segment line and scanning ICs [0014,0265,0288]) for an emissive display (displays include numerous types including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type

Art Unit: 2629

display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the driver comprising:

an input to receive image data for display (image data is input from the image source to the display's picture controller and drivers

[0440,0500,0502,0503]);

a system for formatting said image data into a plurality of subframes (image data matrix created comprising driving data for multiple subframes [0343; Fig. 26] stored in display memory along with ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), each said subframe comprising data for driving a plurality of said row electrodes simultaneously with a plurality of said column electrodes (scanning and segment line drivers drive the lines of the display according to the subframe data in order to build up a display image by the end of the full frame since a frame is a sum of the subframes [0343,0536,0559]); and

an output to output said subframe data for driving said row and column electrodes (scanning and segment line driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]).

Yamano does not expressly disclose wherein all driving data are only positive or zero data.

Smaragdis discloses wherein all data are only positive or zero data (when using the factoring method of non-negative matrix factorization 2D image/video

Art Unit: 2629

information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 35**, *Yamano* discloses a driver (segment line and scanning ICs [0014,0265,0288]) for an emissive display (displays include numerous types including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the driver comprising:

an input for receiving image data for display (image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0502,0503]);

an output to provide data for driving said row and column electrodes of said display (scanning and segment line driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]);

Art Unit: 2629

data memory to store said image data (memory for storing image data within the segment driver IC [0291,0628]);

program memory storing processor implementable instructions (memory 105 stores microcontroller instructions [0630,0632,0637] and ROM 113 stores matrices for processing [0501,0519,0802,0803]); and

a processor coupled to said input, to said output, to said data memory and to said program memory to load and implement said instructions (microcomputer is connected to the display drivers and transmits image data to the data memory and instructions to the program memory where the data memory is connected to the driver ICs which are connected to the output signal lines [0519,0628,0629,0651,0672,0723]), said instructions comprising instructions for controlling the processor to:

input said image data (image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]);

factorise said image matrix into a product of at least a first factor matrix and a second factor matrix (image data factored into scan matrix (row) and column matrix (signal) with ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix defining column drive signals for said display (second matrix of

Art Unit: 2629

scan line X signal line is a matrix of signal line values for one signal line);
and

output said row and column drive signals respectively defined by
said first and second factor matrices (scanning and segment line driver
ICs output driving signals corresponding to the matrix of image driving
data to corresponding columns and rows [0288,0289,0313,0328,0485]).

Yamano does not expressly disclose wherein all the elements of said first
factor matrix are equal to or greater than zero.

Smaragdis discloses wherein all the elements of a first and second factor
matrices are equal to or greater than zero (when using the factoring method of
non-negative matrix factorization 2D image/video information is constructed
using non-negative matrix for analysis [0041-0046] wherein a non-negative data
matrix 151 is factored 160 to produce a first and second factor matrix which are
also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of
ordinary skill in the art to have used non-negative matrix factorization as taught
by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have
been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 36**, *Yamano* discloses a driver (segment line and scanning
ICs [0014,0265,0288]) for an emissive display (displays include numerous types
including OLED [0201,0202]), the display having a plurality of pixels each
addressable by a row electrode and a column electrode (in the matrix type

Art Unit: 2629

display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the driver comprising:

an input to receive image data for display (image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0502,0503])

an output to provide data for driving said row and column electrodes of said display (scanning and segment line driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]);

data memory to store said image data (memory for storing image data within the segment driver IC [0291,0628]);

program memory storing processor implementable instructions (memory 105 stores microcontroller instructions [0630,0632,0637] and ROM 113 stores matrices for processing [0501,0519,0802,0803]); and

a processor coupled to said input, to said output, to said data memory and to said program memory to load and implement said instructions (microcomputer is connected to the display drivers and transmits image data to the data memory and instructions to the program memory where the data memory is connected to the driver ICs which are connected to the output signal lines [0519,0628,0629,0651,0672,0723]), said instructions comprising instructions for controlling the processor to:

input said image data (image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]);

format said image data into a plurality of subframes (image data matrix is formatted to account for the number of subframes within one frame [0343,0536,0559] and the way it is applied is illustrated in Fig. 26), each said subframe comprising data for driving a plurality of said row electrodes simultaneously with a plurality of said column electrodes (the plurality of scan lines are each driven in combination with the driving of the signal lines in order to display the data signal in the pixel during 4 subframes of one frame [0343]; Figs. 27,31,35,39-43. Further, multiple scan lines can be driven simultaneously using the multi-line selection MLS driving [0014,0202,0298,0313,0522]); and

output said subframe data for driving said row and column electrodes (scanning and segment line driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]).

Yamano does not expressly disclose wherein all driving data are only positive or zero data.

Smaragdis discloses wherein all data are only positive or zero data (when using the factoring method of non-negative matrix factorization 2D image/video information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

Art Unit: 2629

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

9. Claims 7, 22, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Yamano* (US 2004/0066363) in view of *Smaragdis* (US 2005/0021333) and *Routley* (GB 2389952).

As to **claim 7**, *Yamano* discloses configuring first and second factor matrices (image data factored into scan matrix (row) and column matrix (signal); Fig. 15) as well as driving respective of peak brightness [0600].

Yamano in view of *Smaragdis* does not expressly reducing a peak pixel brightness of said display compared with a row-by-row driving of said display using said image data.

Routley discloses wherein reducing a peak pixel brightness of a display compared with a row-by-row driving of a display using an image data (variable brightness in the display is achieved by adaptively controlling the supply voltage in accordance with displayed pixel brightness, where variable brightness is achieved by driving the display using variable substantially constant current generators [0070]. Furthermore, a row by row driving method which will not reduce the maximum brightness of the display based on a configuration of row and column matrices (Fig. 5) in which a pixellated passive matrix display is generally only driven a row at a time although appearing to provide a uniformed

Art Unit: 2629

display to a human observer because of the rapidity of the row refresh. Thus the supply voltage may be reduced when this will not reduce the regulated current or pixel brightness of the pixel with the highest drive voltage in a particular row being driven [0032]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have reduced a peak brightness as taught by *Routley* in the driving of *Yamano* as modified by *Smaragdis*. The suggestion/motivation would have been to improve picture quality.

As to **claim 22**, *Yamano* discloses receiving image data (receives input image data for driving the display [0012,0204,0628,0633,0638]) for display by an organic light emitting display (displays include numerous types including OLED [0201,0202]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15);

factorising said image matrix into a product of at least a first factor matrix and a second factor matrix (image data factored into scan matrix (row) and column matrix (signal) with ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix defining column drive signals for said display (second matrix of scan line X signal line is a matrix of signal line values for one signal line); and

driving said display row and column electrodes using said row and column drive signals respectively defined by said first and second factor matrices (display shown in Figs. 16, 26, 27, 31, 35, and 39-43 are being driven according to display matrices of Figs. 8-15).

Yamano does not expressly disclose wherein said factorising comprises non-negative matrix factorisation (NMF).

Smaragdis discloses factorizing image data using non-negative matrix factorization (2D image/video information is constructed using non-negative matrix for analysis [0041-0046]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

Yamano in view of *Smaragdis* does not expressly disclose a carrier carrying a processor control code.

Routley discloses a carrier carrying a processor control code (carrier medium carrying processor control code [0043]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have provided instructions on a carrier medium as taught by *Routley* in the display driving of *Yamano* as modified by *Smaragdis*. The suggestion/motivation would have been to provide a greater consumer base

as well as save money due to the decreased cost of manufacturing and distributing software.

As to **claim 33**, *Yamano* discloses receiving image data for display by an organic light emitting diode display (receiving image data (receives input image data for driving the display [0012,0204,0628,0633,0638]) for display by an organic light emitting display (displays include numerous types including OLED [0201,0202])):

formatting said image data into a plurality of subframes (image data matrix is formatted to account for the number of subframes within one frame [0343,0536,0559] and the way it is applied is illustrated in Fig. 26), each said subframe comprising data for driving a plurality of said row electrodes simultaneously with a plurality of said column electrodes (the plurality of scan lines are each driven in combination with the driving of the signal lines in order to display the data signal in the pixel during 4 subframes of one frame [0343]; Figs. 27,31,35,39-43. Further, multiple scan lines can be driven simultaneously using the multi-line selection MLS driving [0014,0202,0298,0313,0522]); and

driving said row and column electrodes with said subframe data (scanning and segment line drivers drive the lines of the display according to the subframe data in order to build up a display image by the end of the full frame since a frame is a sum of the subframes [0343,0536,0559]).

Yamano does not expressly disclose wherein all driving data are only positive or zero data or wherein said compressing comprises non-negative matrix factorisation.

Smaragdis discloses wherein all data are only positive or zero data and wherein compressing to get the data involves non-negative matrix factorisation (when using the factoring method of non-negative matrix factorization 2D image/video information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

Yamano in view of *Smaragdis* does not expressly disclose a carrier carrying a processor control code.

Routley discloses a carrier carrying a processor control code (carrier medium carrying processor control code [0043]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have provided instructions on a carrier medium as taught by *Routley* in the display driving of *Yamano* as modified by *Smaragdis*. The suggestion/motivation would have been to provide a greater consumer base

Art Unit: 2629

as well as save money due to the decreased cost of manufacturing and distributing software.

Allowable Subject Matter

10. Claims 16-18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

11. Applicant's arguments with respect to claims 1-7, 15-18, 22-24, 26-27, and 30-31 and 32-36 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- a. *Smith* (US 20080291122, 20070046603, 20070085779, 20090128459, 20090128571, 20080246703) are copending applications containing the same subject matter as that claimed.
- b. *Yamano* in view of *Smaragdis* discloses a passive matrix OLED display meeting the limitations of independent claim 1. *Yamano* further discloses a multicolor display wherein image data comprises color image data of the

Art Unit: 2629

multiple colors [0389,0420,0581,0946]; however, they fail both separately or in combination to teach or suggest "factorising by weighting a green color channel with a greater weight than a second color channel to display green more accurately" as claimed in dependent claim 16.

- c. *Mihcak* (US 2007/0076869) teaches representing image data for display on a display screen based on non-negative matrix factorizations.
- d. *Cooper* (US 2005/0123053) teaches parameterizing video data using non-negative matrix factorization.
- e. *Mas* (US 2004/0021654) teaches storing image information for a display in a non-negative matrix with all 0s and 1s.

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert M. Stone whose telephone number is (571)270-5310. The examiner can normally be reached on Monday-Friday 9 A.M. - 4:30 P.M. E.S.T. (alternate Fridays off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chanh D. Nguyen can be reached on (571)272-7772. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert M Stone/
Examiner, Art Unit 2629

/Chanh Nguyen/
Supervisory Patent Examiner, Art
Unit 2629